CIGWELD

Operating Manual

		Part No.
Transarc 250 Si	**(Power Source)**	**625780**
Transarc 300 Si	**(Power Source)**	**625781**

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Manufacturer and Merchandiser of Quality Consumables and Equipment: CIGWELD

Address: 71 Gower St, Preston

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Australia

Description of equipment: Welding Equipment (MMAW & GTAW). CIGWELD Transarc 250Si, 300Si and associated accessories.

* Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

* The equipment conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (Directive 73/23/EU, as recently changed in Directive93/63/EU and to the National legislation for the enforcement of the Directive.

National Standard and Technical Specifications

The product is designed to a number of standards and technical requirements among them are:

* IEC 60974-1 (BS 638-PT10)(EN 60 974-1) applicable to welding equipment and associated accessories.

* AS/NZS 3652-(EMC Directive EN50199) applicable to arc welding equipment - generic emissions and regulations.

* UL (Underwriters Laboratory) rating 94VO flammability testing for all printed - circuit boards used.

* 92/31/EEC-EMC Directive EN50199 applicable to arc welding equipment - generic emissions and regulations.

* Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process, to ensure the product is safe and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

CIGWELD has been manufacturing and merchandising an extensive equipment range with superior performance, ultra safe operation and world class quality for more than 30 years and will continue to achieve excellence.

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1. Introduction

1.1 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorised as follows:

NOTE

An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION

A procedure which, if not properly followed, may cause damage to the equipment.

WARNING

A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.2 Important Safety Precautions

WARNING 1

OPERATION AND MAINTENANCE OF WELDING ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call your local distributor if you have any questions.

GASES AND FUMES

Gases and fumes produced during the welding process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the welding arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Beryllium	Cobalt	Manganese	Selenium
Arsenic	Cadmium	Copper	Mercury	Silver
Barium	Chromium	Lead	Nickel	Vanadium

- Always read the Material Safety Data Sheets (MSDS's) that should be supplied with the material you are using. These MSDS's will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the welding torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapours of chlorinated solvents and cleansers. Remove all sources of these vapours.
- Refer to the Victorian Occupational Health and safety (Confined Spaces) Regulations 1996 and Code of Practice or its equivalent for other states and / or countries.

ELECTRIC SHOCK

Electric Shock can injure or kill. The welding arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically "live" or "hot."
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according with local regulations.
- Disconnect power supply before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.

FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the welding arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapours from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminium workpieces when they are cut underwater or while using a water table. **DO NOT** cut aluminium alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.

NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective earplugs and/or earmuffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.

ARC RAYS

Arc Rays can injure your eyes and burn your skin. The welding arc process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding face shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep welding face shield and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as recommended in this Operating Manual.

2. Electromagnetic Compatibility

WARNING 2

Extra precautions for Electromagnetic Compatibility may be required when this Welding Power Source is used in a domestic situation.

2.1 Installation and use - Users Responsibility

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding circuit, see NOTE 1. In other cases it could involve constructing an electromagnetic screen enclosing the Welding Power Source and the work, complete with associated input filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.

NOTE 1

The welding circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorised by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC 974-13 Arc Welding Equipment - Installation and use (under preparation).

2.2 Assessment of Area

Before installing welding equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account

i) Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the welding equipment.

ii) Radio and television transmitters and receivers.

iii) Computer and other control equipment.

iv) Safety critical equipment, e.g. guarding of industrial equipment.

v) The health of people around, e.g. the use of pacemakers and hearing aids.

vi) Equipment used for calibration and measurement.

vii) The time of day that welding or other activities are to be carried out.

viii) The immunity of other equipment in the environment: the user shall ensure that other equipment being used in the environment is compatible: this may require additional protection measures.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

2.3 Methods of Reducing Electromagnetic Emissions

a) Mains Supply

Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment in metallic conduit or equivalent.

Shielding should be electrically continuous throughout its length. The shielding should be connected to the Welding Power Source so that good electrical contact is maintained between the conduit and the Welding Power Source enclosure.

b) Maintenance of Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilising devices should be adjusted and maintained according to the manufacturer's recommendations.

c) Welding Cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

d) Equipotential Bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching the metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

e) Earthing of the Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of it's size and position, e.g. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

f) Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening the entire welding installation may be considered for special applications.

3. General Information

The Transarc 250 Si, 300 Si are light weight, constant current power sources incorporating the latest digital inverter technology to provide exceptional DC arc characteristics. These models have outstanding arc characteristics across a wide range of Manual Metal Arc Welding (MMAW) electrodes. Arc welding features include built in VRD, hot start control and arc force control. TIG welding features include excellent starting characteristics for lift TIG.

Welding trials, with Voltage Reduction Device turned ON, have shown:

- A superior arc initiation characteristics with all types of electrodes due in part to the very fast response time of the machine once a resistance of less than 175 ohms is sensed, but also due to the hot-start feature;
- Excellent arc stability afforded by the digital inverter technology;
- Good restrike characteristics with rutile coated and iron-powder electrodes (even though the machine is in the low OCV mode), made possible by the fast response time and the presence of the hot-start feature.

Typical applications are maintenance, site work, breakdowns, repairs, light structures and is supplied with a 2.5-3.0 metre primary lead.

3.1 User Responsibility

This equipment will perform as per the information contained herein when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Defective equipment (including welding leads) should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated, should be replaced immediately. Should such repairs or replacements become necessary, it is recommended that appropriately qualified persons approved by CIGWELD carry out such repairs. Advice in this regard can be obtained by contacting accredited CIGWELD Distributor.

This equipment or any of its parts should not be altered from standard specification without prior written approval of CIGWELD. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use or unauthorised modification from standard specification, faulty maintenance, damage or improper repair by anyone other than appropriately qualified persons approved by CIGWELD.

3.2 Duty Cycle

Duty Cycle is the amount of arc-on time (actual welding or cutting time) during any 10 minute period that a machine can operate at it's rated output without damaging internal components. For example, the Transarc 250Si is designed for 40% duty cycle at 250 amps. This means that it has been designed and built to provide the rated amperage, 250 amps, for 4 minutes out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Transarc 250Si must idle and be allowed to cool. The thermal cut-out will operate if the duty cycle is exceeded. As a general rule, a machine rated at more than 35% duty cycle would be more than ample duty cycle for the majority of general-purpose non-automatic welding. Note that all duty cycles are calculated for a maximum ambient temperature of 40°C as per IEC 60974-1. Duty cycles must be reduced, ie reduce the arc-on time, when the ambient temperature exceeds 40°C.

3.3 Terms Of Warranty - April 2002

1. The Trade Practices Act 1974 (Commonwealth) and similar State Territory legislation relating to the supply of goods and services, protects consumers' interests by ensuring that consumers are entitled in certain situations to the benefit of various conditions, warranties, guarantees, rights and remedies (including

warranties as to merchantability and fitness for purpose) associated with the supply of goods and services. A consumer should seek legal advice as to the nature and extent of these protected interests. In some circumstances, the supplier of goods and services may legally stipulate that the said conditions, warranties, guarantees, rights and remedies are limited or entirely excluded. The warranties set out in Clause 2 shall be additional to any non-excludable warranties to which the Customer may be entitled pursuant to any statute.

2. Subject to Clause 3. CIGWELD gives the following warranties to the Customer:

   Insofar as they are manufactured or imported by CIGWELD, goods will upon delivery be of merchantable quality and reasonably fit for the purpose for which they are supplied by CIGWELD.

   CIGWELD will repair or, at its option, replace those of the goods which, upon examination, are found by CIGWELD to be defective in workmanship and/or materials.

   CIGWELD reserves the right to request documented evidence of date of purchase.

3. The Warranty in Clause 2;

   Is conditional upon:

   The Customer notifying CIGWELD or our Accredited Distributor in writing of its claim within seven (7) days of becoming aware of the basis thereof, and at its own expense returning the goods which are the subject of the claim to CIGWELD or nominated Accredited Distributor/Accredited Service Agent.

   The goods being used in accordance with the Manufacturer's Operating Manuals, and under competent supervision.

   Does not apply to:

   Obsolete goods sold at auction, second-hand goods and prototype goods.

   Breakdown or malfunction caused by accident, misuse or normal wear and tear.

   Repairs or replacement made other than by CIGWELD or Accredited Service Agents, unless by prior arrangement with CIGWELD.

   Replacement parts or accessories which may affect product safety or performance and which are not manufactured, distributed or approved by CIGWELD.

4. CIGWELD declares that, to the extent permitted by law, it hereby limits its liability in respect of the supply of goods which are not of a kind ordinarily acquired for personal, domestic or household use or consumption to any one or more of the following (the choice of which shall be at the option of CIGWELD).

   The replacement of the goods or the supply of equivalent goods.

   The repair of goods.

   The payment of cost of replacing the goods or acquiring equivalent goods.

   The payment of the cost of having goods repaired.

5. Except as provided in Clauses 2 to 4 above, to the extent permitted by statute, CIGWELD hereby excludes all liability for any loss, damage, death or injury of any kind whatsoever occasioned to the Customer in respect of the supply of goods including direct, indirect, consequential or incidental loss, damage or injury of any kind.

3.4 Warranty Schedule - April 2002

These warranty periods relate to the warranty conditions in clause 2. All warranty periods are from date of sale from the Accredited Distributor of the equipment. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date CIGWELD delivered the product to the Accredited Distributor. Unless otherwise stated the warranty period includes parts and labour.

CIGWELD reserves the right to request documented evidence of date of purchase.

Transarc 250Si, 300Si	***WARRANTY PERIOD***
Main Power Magnetics	2 years (Labour 1 year)

Original Main Power Rectifiers, Control P.C. Boards	..... 2 years (Labour 1 year)
All other circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, power switch semi-conductors	..... 1 year

Please note that the information detailed in this statement supersedes any prior published data produced by CIGWELD.

WARNING 3

For the purpose of safety and performance and to protect your CIGWELD Equipment Warranty always use genuine CIGWELD replacement parts and accessories.

4. Safe Practices For The Use Of Welding Equipment

In many situations the "striking" voltage can be hazardous. Any person touching simultaneously the electrode lead/terminal and the work lead/terminal may receive a serious electrical shock. Additional precautions must be exercised where two Welding Power Sources are being used close to each other because, under certain conditions, the voltages between the welding terminals of the two Welding Power Sources could be two times the specified open circuit voltage.

It is essential that the Welding Power Source be correctly installed, if necessary, by a qualified electrician and maintained in sound mechanical and electrical condition. It is also important that the Welding Power Source be switched off when not in use.

4.1 Precautions to be Taken by Operators

- Whenever practicable, all parts of the welding circuit should be isolated from earth and other conducting material and under no circumstances should any earthing conductor of the electrical installation be used in place of the work lead.
- The Mains supply voltage should be switched off before connecting or disconnecting welding leads. Welding lead connections must have clean contact surfaces and must be securely tightened. Poor connections will result in overheating and loss of welding current. All parts of the welding circuit, including the return paths, are to be considered electrically alive, so the operator must ensure that no part of the body is placed in such a position that it will provide a path for an electric current.
- Welding operators should avoid direct contact with the work to be welded or against any metal in contact with the work. When this cannot be avoided the operator must not touch any exposed portion of the electrode holder with any part of the body. Should this occur, the operator will risk completing the electrical circuit through the body.
- When welding in confined spaces, where reasonable movement is restricted, particular care must be taken to ensure that the area is well ventilated and the operator is under constant observation by a person who can immediately switch off the power and give assistance in an emergency.
- The flux covering of an electrode cannot be assumed to provide effective insulation, consequently an insulating glove must be worn when placing an electrode into its holder, or should it be necessary to handle an electrode once it is in contact with its holder.
- During pauses between welding runs, electrode holders should be so placed that they cannot make electrical contact with persons or conductive objects.
- The welding leads, both the electrode lead and the work lead, must be protected from damage. Damaged leads must not be used.
- Keep combustible materials away from the welding area. Have a suitable fire extinguisher handy.
- Do not stand on damp ground when welding.

4.2 Personal Protection

The radiation from an electric arc during the welding process can seriously harm eyes and skin. It is essential that the following precautions be taken:

- Gloves should be flameproof gauntlet type to protect hands and wrists from heat burns and harmful radiations. They should be kept dry and in good repair.
- Protective clothing must protect the operator from burns, spatter and harmful radiation. Woollen clothing is preferable to cotton because of its greater flame resistance. Clothing should be free from oil or grease. Wear leggings and spats to protect the lower portion of the legs and to prevent slag and molten metal from falling into boots or shoes.
- Face Shield

  It is recommended to use a welding face shield, conforming to the relevant standards, when electric arc welding. Use a welding face shield in serviceable condition and fitted with an eye filter lens to safely reduce harmful radiation from the arc as per Table 1.

Description of Process	Approximate Range of Welding Current Amperes	Filters Recommended Shade Number
MMAW Stick Welding Electrodes	40-100	8
MMAW Stick Welding Electrodes	100-200	10
MMAW Stick Welding Electrodes	200-300	11
MMAW Stick Welding Electrodes	300-400	12
GTAW Tungsten Inert Gas (TIG)	5-100	10
GTAW Tungsten Inert Gas (TIG)	100-200	11
GTAW Tungsten Inert Gas (TIG)	200-250	12
GTAW Tungsten Inert Gas (TIG)	250-350	13

Table 1 - Filter lens size verses welding current

Protective filter lenses are provided to reduce the intensity of radiation entering the eye thus filtering out harmful infra-red, ultra-violet radiation and a percentage of the visible light. Such filter lenses are incorporated within face shields. To prevent damage to the filter lenses from molten or hard particles an additional hard clear glass or special clear external cover lens is provided. This cover lens should always be kept in place and replaced before the damage impairs your vision while welding.

5. Resuscitation For Electric Shock Victims

Electric shock may kill immediately. Early resuscitation is required if a life is to be saved. Every Second Counts! Electrical currents may:

- Stop the heart;
- Cause contraction of the muscles of the body;
- Paralyse breathing due to paralysis of the centre of respiration in the brain;
- Cause burns.

The victims often cannot free themselves from the current and may not be able to breathe due to fixation of the chest.

5.1 Resuscitation

Efficient resuscitation requires training which is available from the St John's Ambulance Association, Red Cross and other sources.

1 Don't become a victim. Switch off power if possible. If not, remove victim from contact, using some insulating material.

2 If unconscious, place victim on their side and clear vomit and other foreign matter from mouth. Check for breathing by look, listen and feel. If not breathing, commence expired air resuscitation (E.A.R.). This should take no longer than 3 or 4 seconds.

3 Place victim flat on their back on a hard surface, open airway – using head tilt and jaw support as shown.

4 Begin artificial breathing - 5 full breaths in 10 seconds, sealing nostrils with cheek or holding nose closed.

5 Check carotid pulse in neck. If pulse is present, continue E.A.R.
15 breaths per minute for adults.
20 breaths per minute for children.

6 If pulse is absent and you have been trained, begin cardio pulmonary resuscitation (C.P.R). Cardiac Compression – depress lower end of breast bone (sternum) 4cm to 5cm, less for small children.
<u>One rescuer</u> - 2 breaths, 15 compressions in 15 seconds, i.e. 4 cycles per minute.
<u>Two rescuers</u> - 1 breath, 5 compressions in 5 seconds, i.e. 12 cycles per minute.

7 Check for return of pulse and breathing after 1 minute and at least every 2 minutes. Continue uninterrupted until trained assistance is available. When breathing and pulse return, turn on side and continue observation.

6. Specifications

Description (NOTE 2)	Transarc 250Si	Transarc 300Si
Power Source Part Number	625780	625781
Plant Part Number	N/A	N/A
Cooling	Fan Cooled	Fan Cooled
Welder Type & Welding process	Heavy Duty Inverter; DC MMAW (Stick) & GTAW (TIG)	Heavy Duty Inverter; DC MMAW (Stick) & GTAW (TIG)
Welding Power Source mass	17kg	21kg
Dimensions	H360mm x W180mm x D420mm	H420mm x W210mm x D450mm
Designed to European Standard	IEC 60974-1	IEC 60974-1
Number of Phases	Three Phase	Three Phase
Nominal Supply Voltage	415V ±10%	415V ±10%
Nominal Supply Frequency	50/60Hz	50/60Hz
Mains Fuse & **Circuit** to suit factory fitted Lead that will achieve the following rated weld current/weld process: GTAW Current & Duty Cycle MMAW Current & Duty Cycle	✦ 17A/Phase 250A @ 40% 250A @ 40%	✦ 22A/Phase 300A @ 30% 300A @ 30%
Maximum TIG Current & Duty Cycle	250A @ 40%	300A @ 30%
Maximum MMAW Current & Duty Cycle	250A @ 40%	300A @ 30%
GTAW Welding Current @ 100% Duty Cycle	160A	160A
MMAW Welding Current @ 100% Duty Cycle	160A	160A
Effective Input Current for Max Welding Current @ 100% Duty Cycle	10.8A/Phase	12A/Phase
Maximum Input Current for Max Welding Current	17A/Phase	22A/Phase
Maximum Input Current for Short Circuit	17A/Phase	22A/Phase
Single Phase Generator Requirement	♣ 12.5kVA	♣ 16kVA
Flexible Supply Cable Size Factory Fitted	25A Heavy Duty	25A Heavy Duty
Thermal Protection	Self Resetting Thermostat	Self Resetting Thermostat
Welding Current Range	5 – 250A	5 – 300A
Nominal Open Circuit Voltage (OCV)	62V	62V

✦ Motor start fuses or thermal circuit breakers are recommended for this application.

♣ The Generators stated kVA ratings MUST be adhered to minimise the welding Power Source's possible failure as a result of inadequate Mains Power at the welder's MAXIMUM welding current and MAXIMUM duty cycle. Warranty will be void if the welding Power Source fails as a result of being operated on inadequate Mains Power.

NOTE 2

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

6.1 Weld Parameter Ranges and Controls

a) HOT START

This parameter operates in *STICK* mode and improves the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the *WELD* current.

e.g. *HOT START* current = 150 amps when Weld Current = 100 amps & *HOT START* = 50A

b) WELD

This parameter sets the STICK & Lift TIG weld current.

c) ARC CONTROL

This parameter operates in *STICK* mode only and is used to adjust percentage increase in welding current and is proportional to arc length (arc voltage). This control provides an adjustable amount of arc control (or dig). This feature can be particularly beneficial in providing the operator with the ability to compensate for variability in joint fit up in certain situations with particular electrodes, eg cellulose and hydrogen controlled electrodes. In all welding processes, the amount of penetration obtained is dependent on the welding current; ie the greater the penetration, the greater the current.

Arc Force Position	Current Increase when Arc Voltage is less than 18V	Effect on Welding Performance
Minimum (0)	0A	Soft arc, Low spatter, Low penetration
Medium (20%)	32A	Normal arc, Improved fusion characteristics, Normal penetration
Maximum (100%)	160A	Hard arc, Deep penetration

In general, having the ARC CONTROL set at 100% (maximum) allows greater penetration control to be achieved. With the ARC CONTROL set at 0% (minimum) the Power Source has a constant current characteristic. In other words, varying the arc length does not significantly effect the welding current. When the ARC CONTROL set to 100%, it is possible to control the welding current by varying the arc length. This is very useful for controlling penetration on root runs and side wall wash on vertical up fillet welds.

i) Root runs

During root runs the weld pool forms a “keyhole” shape. If too much weld current is used, the hole blows out and the weld collapses. If too little weld current is used, the hole closes up and penetration is lost. The size of the hole also determines the arc length; ie as the hole gets bigger, the arc gets longer.

If arc force is used, the increase in the arc length causes the weld current to decrease until the hole starts to close up but if the hole closes up to much then the arc length decreases which causes the weld current to increase. Too little or too much arc force makes this process unstable. The operator must adjust the arc force until a happy medium is reached.

ii) Vertical up welding

When welding vertical up with arc force on, the operator can control the amount of current by changing arc length, ie voltage. Weld metal is deposited by "digging" the electrode into the side of the base metal joint and then increasing the arc length with a flicking motion, to allow the weld pool to freeze, before digging the electrode into the other side of the base metal joint.

Without arc force, increasing the arc length does not decrease the weld current sufficiently and the operator has to manually decrease the current via a remote current control to freeze the weld pool. This welding current reduction also reduces the penetration.

The arc force allows the weld pool to freeze during the "flick" phase without decreasing the amount of weld current available during the "dig" phase thus maximising penetration.

d) Weld Parameters for Transarc 250 Si

				Weld Mode	
Weld Parameter	**Parameter Range**	**Factory Setting**	**Incremental Unit**	**STICK**	**LIFT TIG**
HOT START	0 to 70A	20A	1A	✓	✘
WELD	5 to 250A	80A	1A	✓	✓
ARC CONTROL	0 to 100%	10%	1%	✓	✘

Table 2 - Weld Parameters for Transarc 250 Si

e) Weld Parameters for Transarc 300 Si

				Weld Mode	
Weld Parameter	**Parameter Range**	**Factory Setting**	**Incremental Unit**	**STICK**	**LIFT TIG**
HOT START	0 to 70A	20A	1A	✓	✘
WELD	5 to 300A	80A	1A	✓	✓
ARC CONTROL	0 to 100%	10%	1%	✓	✘

Table 3 - Weld Parameters for Transarc 300 Si

6.2 Power Source Features

Feature	Description
New Digital Control	• Almost all welding parameters are adjustable
Touch Panel Switches	• Touch switches eliminate mechanical damage
Front Control Cover	• Protects front panel controls
Digital Meter	• Displays selected weld parameter value • Displays average weld current when welding • Displays average weld current for 8 seconds after weld has been completed • A selected weld parameter value can be adjusted at any time even whilst welding

Feature	Description
Intelligent Fan Control	• The intelligent cooling system is designed to reduce dust and foreign material build-up, whilst providing optimum cooling. • Fan speed reduces approximately 30 seconds after machine is turned on • Fan speed increases when internal components reaches operating temperature
ON/OFF switch	• Mains ON/OFF switch located on rear panel
Voltage Reduction Device (VRD)	• VRD fully complies to IEC 90674-1 • With VRD TURNED ON and Stick mode selected, the green VRD light is ON when not welding • With VRD TURNED ON and Stick mode selected, the red VRD light is ON when welding • With VRD TURNED OFF and Stick mode selected, the red VRD light is ON when not welding and welding • Expense after market VRD NOT required
Control Knob	• For the selected weld parameter, rotating the knob clockwise increase the parameter • Rotating the knob anti-clockwise decrease the parameter • A selected weld parameter value can be adjusted at any time even whilst welding • Pushing the knob in sets the selected parameter then displays the next parameter
Self Diagnosis Using Error Codes	• An error code is displayed on the *Digital Meter* when a problem occurs with Mains supply voltage or internal component problems. Refer to section 15.3 on page 30
Buzzer	• Buzzer identifies when a parameter is set, error code is displayed

6.3 Product Contents

Description	Transarc 250Si 625780	Transarc 300Si 625781
Welding Power Source	✓	✓
Multi-pin plug	✓	✓
Two Dinse Connectors	✓	✓
Operating Manual	✓	✓

6.4 Accessories

Part Number	Description	Transarc 250Si	Transarc 300Si
OTD10/4007	Remote ON/OFF Switch	✓	—
OTD10/4013	Remote ON/OFF Switch & Current Control	✓	—
OTD10/4014	Remote Pendant Current Control	✓	—
OTD10/4016	Remote Foot Current Control	✓	—

Part Number	Description	Transarc 250Si	Transarc 300Si
OTD10/2001	Remote ON/OFF Switch	—	✓
OTD10/2004	Remote ON/OFF Switch & Current Control	—	✓
OTD10/2005	Remote Pendant Current Control	—	✓
OTD10/2007	Remote Foot Current Control	—	✓
646325	8M 400A Welding Lead Set	✓	✓
453833	Hiderok Helmet	✓	✓
704828	8M 330A Work Lead	✓	✓
646363	Wire Brush, 4 rows	✓	✓
BGSAK2	TIG Torch Accessory Kit	✓	✓
305720401	250A TIG Torch, 4M, Rigid Neck, Gas Valve	✓	✓
700433	Gas Hose with fittings	✓	✓
BGSAK2	TIG Torch Accessory Start up Kit	✓	✓
301526	Flowmeter/Regulator	✓	✓

7. Voltage Reduction Device (VRD)

WARNING

WELDING IN HAZARDOUS ENVIRONMENTS

Before welding in hazardous environments the VOLTAGE REDUCTION DEVICE (VRD) MUST BE TURNED ON. For example confined spaces, wet areas and hot humid conditions are classed as hazardous environments.

WARNING

VRD TURN ON PROCEDURE

CIGWELD recommends that an Accredited CIGWELD Service Agent TURNS ON the VOLTAGE REDUCTION DEVICE (VRD) as they have the knowledge and equipment to preform this operation.

WARNING TO EMPLOYERS

Workplace safety legislation imposes substantial duties on employers to provide a safe workplace and equipment for its employees.
If an employer fails to do so criminal prosecution of the company and its senior officers and employees may result with substantial penalties including fines and in certain cases jail sentences.
It is therefore essential employers acquire safe equipment and ensure its employees are properly trained in its use.

7.1 VRD Specification

With the VRD TURN ON, this equipment meets the following specifications

Description	Transarc 250Si, 300Si	Notes
VRD Open Circuit Voltage	15.3 to 19.8V	Open circuit voltage between welding

		terminals
VRD Resistance	148 to 193 ohms	The required resistance between welding terminals to turn ON the welding power
VRD Turn OFF Time	0.2 to 0.3 seconds	The time taken to turn OFF the welding power once the welding current has stopped

7.2 VRD Maintenance

Routine inspection and testing (power source)

An inspection of the power source, an insulation resistance test and an earthing resistance test shall be carried out in accordance with clause 4.1 of **AS 1647.2**

a) For transportable equipment, at least once every 3 months; and

b) For fixed equipment, at least once every 12 months.

The owners of the equipment shall keep a suitable record of the periodic tests.

Note 3

A transportable power source is any equipment that is not permanently connected and fixed in the position in which it is operated.

In addition to the above tests and specifically in relation to the VRD fitted to this machine, the following periodic tests should also be conducted by an accredited CIGWELD service agent.

Description	AS3195 & IEC 60974-1 Requirements
VRD Open Circuit Voltage	Less than 20V; at Vin = 415V
VRD Turn ON Resistance	Less than 200 ohms
VRD Turn OFF Time	Less than 0.3 seconds

If this equipment is used in a hazardous location or environments with a high risk of electrocution then the above tests should be carried out prior to entering this location.

8. Installation Recommendations

8.1 Environment

The Transarc 250Si, 300Si are designed for use in hazardous environments when the VRD is TURNED ON.

a) Examples of environments with increased hazardous environments are -

i) In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts;

ii) In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator, or

iii) In wet or damp hot locations where humidity or perspiration considerable reduces the skin resistance of the human body and the insulation properties of accessories.

b) Environments with hazardous environments do not include places where electrically conductive parts in the near vicinity of the operator, which can cause increased hazard, have been insulated.

8.2 Location

Be sure to locate the welder according to the following guidelines:

a) In areas, free from moisture and dust.
b) Ambient temperature between 0°C to 40°C.
c) In areas, free from oil, steam and corrosive gases.
d) In areas, not subjected to abnormal vibration or shock.
e) In areas, not exposed to direct sunlight or rain.
f) Place at a distance of 300mm or more from walls or similar that could restrict natural air flow for cooling.

8.3 Ventilation

Since the inhalation of welding fumes can be harmful, ensure that the welding area is effectively ventilated.

8.4 Mains Supply Voltage Requirements

The Mains supply voltage should be within ± 10% of the rated Mains supply voltage. Too low a voltage may cause the fuse or circuit breaker to rupture due to the increased primary current. Too high a supply voltage will cause the Power Source components to fail.

WARNING 4

CIGWELD advises that this equipment be electrically connected by a qualified electrical trades-person.

9. Transarc 250Si, 300Si Controls

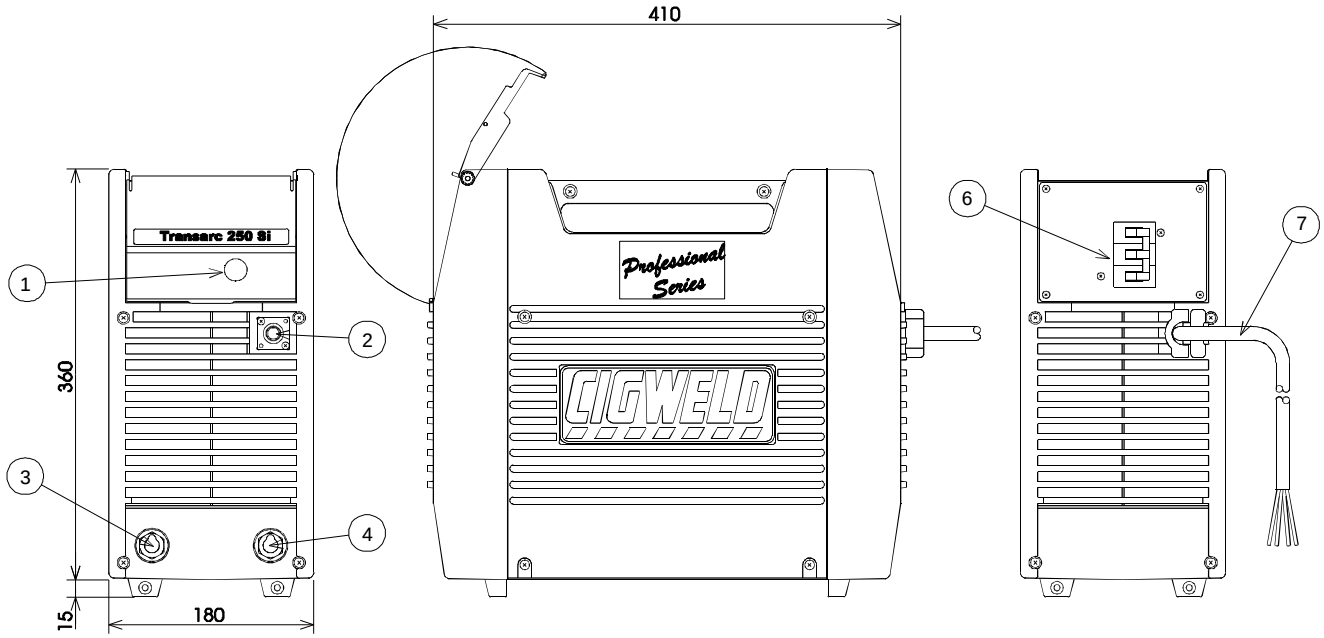


Figure 1 – Transarc 250Si Power Source

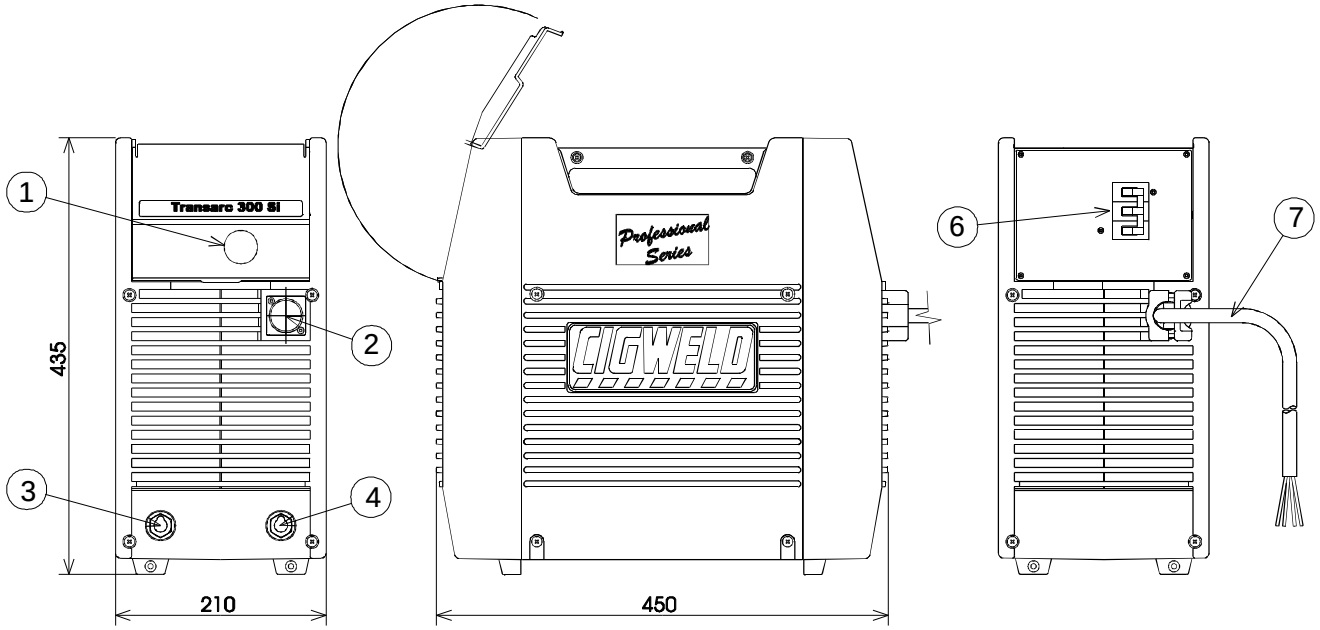


Figure 2 – Transarc 300Si Power Source

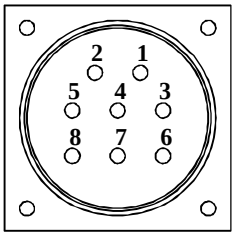
9.1 Control Knob ①

This control sets the selected weld parameter, rotating it clockwise increase the parameter whilst anti-clockwise rotation decreases the parameter. Pushing the knob in sets the adjusted parameter and the intelligent control proceeds to the next weld parameter for the selected weld mode.

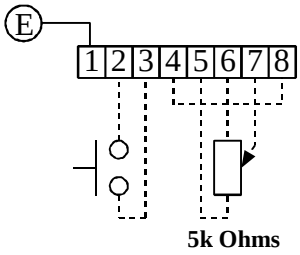
9.2 Remote Control Socket

a) Transarc 250Si

The 8 pin Remote Control Socket is used to connect remote current control devices to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.



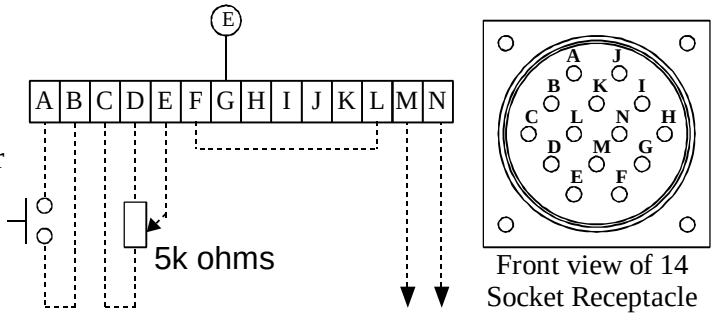
Front view of 8-Socket Receptacle



Socket Pin	Function
1	Mains Earth
2	Torch Switch Input (24V) to energise weld current. (connect pins 2 & 3 to turn on welding current)
3	Torch Switch Input (0V) to energise weld current (connect pins 2 & 3 to turn on welding current)
4	Connect pin 4 to pin 8 to instruct machine that a remote control device is connected (12V DC supply)
5	5k ohm (maximum) connection to 5k ohm remote control potentiometer
6	Zero ohm (minimum) connection to 5k ohm remote control potentiometer
7	Wiper arm connection to 5k ohm remote control potentiometer
8	Connect pin 4 to pin 8 to instruct machine that a remote control device is connected (0V)

b) Transarc 300Si

The 14 pin Remote Control Socket is used to connect remote current control devices to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.



Front view of 14 Socket Receptacle

Socket Pin	Function
A	Torch Switch Input (24V) to energise weld current. (connect pins A & B to turn on welding current)
B	Torch Switch Input (0V) to energise weld current (connect pins A & B to turn on welding current)
C	5k ohm (maximum) connection to 5k ohm remote control potentiometer
D	Zero ohm (minimum) connection to 5k ohm remote control potentiometer
E	Wiper arm connection to 5k ohm remote control potentiometer
F	Connect pin 4 to pin 8 to instruct machine that a remote control device is connected (0V)
G	Mains Earth
H,I,J,K	Not Used
L	Connect pin 4 to pin 8 to instruct machine that a remote control device is connected (12V DC supply)
M	OK to move current detect signal for robotics applications
N	OK to move current detect signal for robotics applications

9.3 Positive Terminal

Welding current flows from the Power Source via heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

9.4 Negative Terminal

Welding current flows from the Power Source via heavy duty bayonet type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

CAUTION 1

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

9.5 ON/OFF Switch

This switch connects the Mains supply voltage to the inverter when in the ON position. This enables the user to commence welding

WARNING 5

When the welder is connected to the Mains supply voltage, the internal electrical components maybe at 240V potential with respect to earth.

9.6 Input Cable

The input cable connects the Mains supply voltage to the equipment.

10. Set-up For MMAW (Stick) and GTAW (TIG)

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to workpiece and electrode lead is used to hold electrode. Wide safety margins provided by the coil design ensure that the Welding Power Source will withstand short term overload without adverse effects. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrodes, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide, then finally adjust the current setting to suit the application.

WARNING 6

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the Mains power supply is switched off.

CAUTION 2

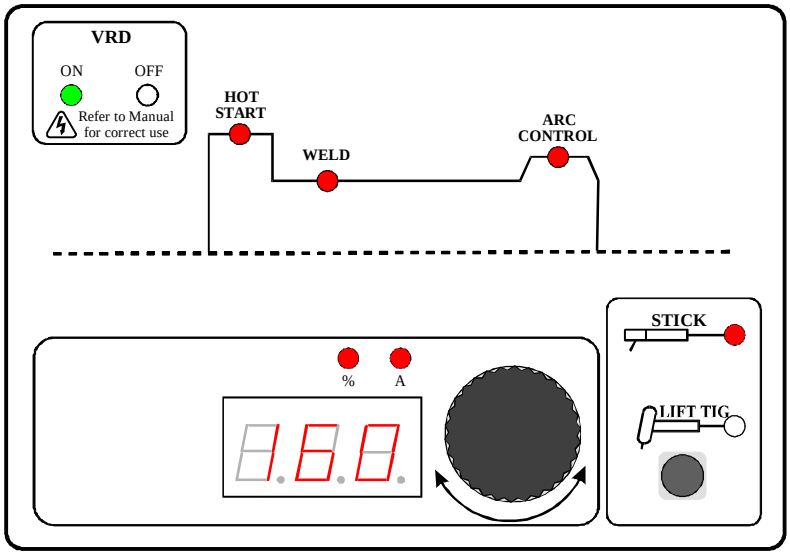
Remove any packaging material prior to use. Do not block the air vents at the front or rear or sides of the Welding Power Source.

11. Sequence Of Operation

NOTE 4

The control panels shown operation are the same for all models. The Transarc 250Si control panels are shown throughout this section. To view each individual weld parameter value press the control knob.

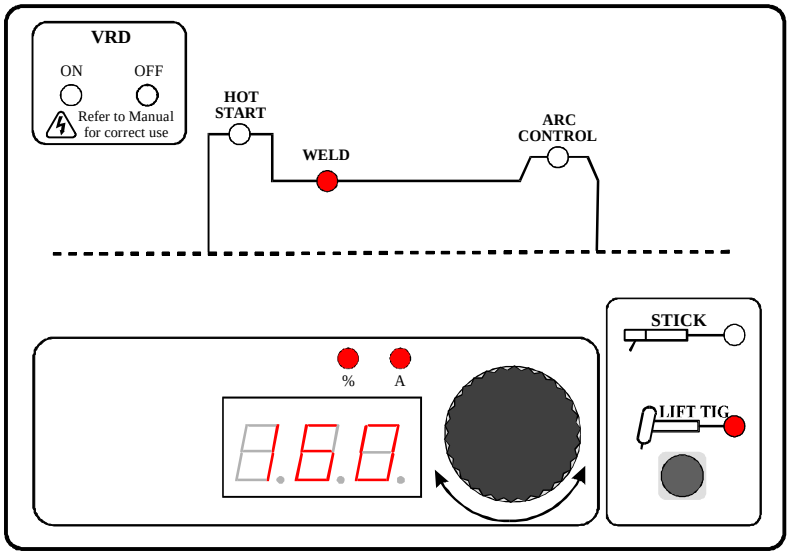
11.1 Stick Welding



- Refer to NOTE 4 on page 22
- Refer to section 7 on page 17 for recommendations on VRD.
- Connect work lead to negative terminal
- Connect electrode lead to positive terminal
- Switch machine on
- Set *HOT START* current, press control knob
- Set *WELD* current, press control knob
- Set *ARC CONTROL* percentage, press control knob
- Connect remote control device if required
- Commence welding

Figure 3 – *STICK* mode

11.2 LIFT TIG Welding



- Refer to NOTE 4 on page 22
- Connect work lead to positive terminal
- Connect TIG torch to negative terminal
- Switch machine on
- Set *WELD* current
- Connect remote control device if required
- Commence welding

Figure 4 – *LIFT TIG* Mode

12. Basic TIG Welding Guide

12.1 Electrode Polarity

Connect the TIG torch to the '–' terminal and the work lead to the '+' terminal for direct current straight polarity. Direct current straight polarity is the most widely used polarity for DC TIG welding. It allows limited wear of the electrode since 70% of the heat is concentrated at the work piece.

12.2 Tungsten Electrode Current Ranges

Electrode Diameter (mm)	Constant Current (A)
1.0	2 – 30
1.6	8 – 70
2.4	12 – 150
3.2	20 – 250

Table 4 - Current ranges for varies tungsten electrode sizes

12.3 CIGWELD Tungsten Electrode Types

Electrode Type (Ground Finish)	Welding Application	Features	Colour Code
Thoriated 2%	DC welding of mild steel, stainless steel and copper.	Excellent arc starting, Long life, High current carrying capacity.	Red
Ceriated 2%	DC & AC welding of mild steel, stainless steel, copper, aluminium, magnesium and their alloys	Longer life, More stable arc, Easier starting, Wider current range, Narrower more concentrated arc.	Grey

Table 5 - CIGWELD tungsten electrode types

NOTE 5

DC welders can not be used for major AC welding application.

12.4 Welding Parameters for Stainless Steel

Base Metal Thickness	DC Current Range for Mild Steel	DC Current Range for Stainless Steel	Filler Rod Dia. (if required)	Argon Gas Flow Rate Litres/min.	Joint Type
1.0mm	35-45 40-50	20-30 25-35	1.6mm	5-7	Butt/Corner Lap/ Fillet
1.2mm	45-55 50-60	30-45 35-50	1.6mm	7	Butt/Corner Lap/ Fillet
1.6mm	60-70 70-90	40-60 50-70	1.6mm	7	Butt/Corner Lap/ Fillet
3.2mm	80-100 90-115	65-85 90-110	2.4mm	7	Butt/Corner Lap/ Fillet
4.8mm	115-135 140-165	100-125 125-150	3.2mm	10	Butt/Corner Lap/ Fillet
6.4mm	160-175 170-200	135-160 160-180	4.0mm	10	Butt/Corner Lap/ Fillet

Table 6 - TIG welding parameters

12.5 Guide for Selecting Filler Wire Diameter

Welding Current (A)	Filler Wire Diameter (mm). Refer to NOTE 6.
10-20	1.2
20-50	1.2 - 1.6
50 – 100	1.6 - 2.4
100 – 200	1.6 - 3.2

Table 7 - Filler wire selection guide

NOTE 6

The filler wire diameter specified in Table 7 is a guide only, other diameter wires may be used according to the welding application.

12.6 Shielding Gas Selection

Alloy	Shielding Gas Argoshield is a registered trade mark of BOC Gases Limited.
Carbon Steel	Welding Argon; 100% Ar
Stainless Steel	Welding Argon, Argoshield 71T, 80T, 81T
Nickel Alloy	Welding Argon, Argoshield 71T
Copper	Welding Argon, Argoshield 81T
Titanium	Welding Argon, Argoshield 80T, 81T

Table 8 - Shielding gas selection

12.7 Welding Parameters for Low Carbon & Low Alloy Steel Pipe

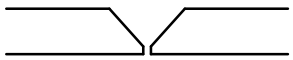
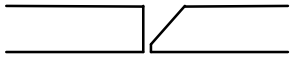
Electrode Type & Diameter	Current Range DC Amperes	Filler Rod for Root Pass	Joint Preparation
Thoriated 2% 2.4 mm	120 - 170	Yes	
Thoriated 2% 2.4 mm	100 - 160	Yes	
Thoriated 2% 2.4 mm	90 - 130	No	

Table 9 - TIG welding parameters for low carbon & low alloy steel pipe

13. Basic Arc Welding Guide

13.1 Electrode Polarity

Stick electrodes are generally connected to the '+' terminal and the work lead to the '–' terminal but if in doubt consult the electrode manufacturers literature.

13.2 Effects of Stick Welding Various Materials

a) High tensile and alloy steels

The two most prominent effects of welding these steels are the formation of a hardened zone in the weld area, and, if suitable precautions are not taken, the occurrence in this zone of under-bead cracks. Hardened zone and under-bead cracks in the weld area may be reduced by using the correct electrodes, preheating, using higher current settings, using larger electrodes sizes, short runs for larger electrode deposits or tempering in a furnace.

b) Manganese steels

The effect on manganese steel of slow cooling from high temperatures is to embrittle it. For this reason it is absolutely essential to keep manganese steel cool during welding by quenching after each weld or skip welding to distribute the heat.

c) Cast Iron

Most types of cast iron, except white iron, are weldable. White iron, because of its extreme brittleness, generally cracks when attempts are made to weld it. Trouble may also be experienced when welding white-heart malleable, due to the porosity caused by gas held in this type of iron.

d) Copper and alloys

The most important factor is the high rate of heat conductivity of copper, making preheating of heavy sections necessary to give proper fusion of weld and base metal.

13.3 Types of Electrodes

Arc Welding electrodes are classified into a number of groups depending on their applications. There are a great number of electrodes used for specialised industrial purposes which are not of particular interest for everyday general work. These include some low hydrogen types for high tensile steel, cellulose types for welding large diameter pipes, etc.

The range of electrodes dealt with in this publication will cover the vast majority of applications likely to be encountered; are all easy to use and all will work on even the most basic of welding machines.

Metals being joined	Electrode Size & Part No.	CIGWELD Electrode	Comments
Mild steel	2.5mm 611182 3.2mm 611183 4.0mm 611184	Satincraft 13 (AS/NZS E4113-0)	Ideal electrodes for all general purpose work. Features include out standing operator appeal, easy arc starting and low spatter.
Mild steel	2.5mm 611242 3.2mm 611243 4.0mm 611244	Ferrocraft 21 (AS/NZS E4818-2)	All positional electrode for use on mild and galvanised steel furniture, plates, fences, gates, pipes and tanks etc. Especially suitable for vertical-down welding.
Cast iron	3.2mm 611733 4.0mm 611734	Castcraft100	Suitable for joining all cast irons except white cast iron.
Stainless steel	2.5mm 611652 3.2mm 611653	Satincrome 318L-17 (AS/NZS E316L-17)	High corrosion resistance. Ideal for dairy work, etc. On stainless steels.
Copper, Bronze, Brass, etc.	3.2mm 611783	Bronzecraft (AS/NZS E6200-A2)	Easy to use electrode for marine fittings, water taps and valves, water trough float arms, etc. Also for joining copper to steel and for bronze overlays on steel shafts.
High Alloy Steels, Dissimilar Metals, Crack Resistance. All Hard-To-Weld Jobs.	2.5mm 611702 3.2mm 611703 4.0mm 611704	Weldall (AS/NZS E312-17)	Weldall does truly what its name states. It will weld even the most problematical jobs such as springs, shafts, broken joins mild steel to stainless and alloy steels. Not suitable for Aluminium.

Table 10 - Types of Electrodes

For HARDFACING of Steels, CIGWELD TOOLCRAFT is an electrode that produces an extremely hard weld deposit. It is ideal for building up axes, wedges, slasher blades, worn cams, rock drills, earth moving and digging equipment, etc.

14. Routine Inspection, Testing & Maintenance

WARNING 7

There are extremely dangerous voltage and power levels present inside this product. Do not attempt to open or repair unless you are an Accredited CIGWELD Service Agent. Disconnect the Welding Power Source from the Mains Supply Voltage before disassembling.

An inspection of the power source, an insulation resistance test and an earthing resistance test shall be carried out in accordance with clause 4.1 of **AS 1647.2**

a) For transportable equipment, at least once every 3 months; and

b) For fixed equipment, at least once every 12 months.

The owners of the equipment shall keep a suitable record of the periodic tests.

Note 7

A transportable power source is any equipment that is not permanently connected and fixed in the position in which it is operated.

In addition to the above tests and specifically in relation to the VRD fitted to this machine, the following periodic tests should also be conducted by an accredited CIGWELD service agent.

Description	AS3195 & IEC 60974-1 Requirements
VRD Open Circuit Voltage	Less than 20V; at Vin=240V
VRD Turn ON Resistance	Less than 200 ohms
VRD Turn OFF Time	Less than 0.3 seconds

If this equipment is used in a hazardous location or environments with a high risk of electrocution then the above tests should be carried out prior to entering this location.

Welding equipment should be regularly checked by a qualified electrical tradesperson to ensure that:

- The main earth wire of the electrical installation is intact.
- Power point for the Welding Power Source is effectively earthed and of adequate current rating.
- Plugs and cord extension sockets are correctly wired.
- Flexible cord is of the 3-core tough rubber or plastic sheathed type of adequate rating, correctly connected and in good condition.
- Welding terminals are shrouded to prevent inadvertent contact or short circuit.
- The frame of the Welding Power Source is effectively earthed.
- Welding leads and electrode holder are in good condition.
- The Welding Power Source is clean internally, especially from metal filing, slag, and loose material. If any parts are damaged for any reason, replacement is recommended.

14.1 Face Shield Maintenance (where supplied)

The face shield and lens should be cleaned after use with a soft cloth.

15. Basic Troubleshooting

WARNING 8

There are extremely dangerous voltage and power levels present inside this product. Do not attempt to open or repair unless you are an Accredited CIGWELD Service Agent and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an Accredited CIGWELD Service Agent for repair.

The basic level of troubleshooting is that which can be performed without special equipment or knowledge.

15.1 TIG Welding Problems

Description	Possible Cause	Remedy
1 Electrode melts when arc is struck.	Electrode is connected to the '+' terminal.	Connect the electrode to the '–' terminal.
2 Dirty weld pool.	A Electrode contaminated through contact with work piece or filler rod material. B Gas contaminated with air.	A Clean the electrode by grinding off the contaminates. B Check gas lines for cuts and loose fitting or change gas cylinder.

Description	Possible Cause	Remedy
3 Electrode melts or oxidises when an arc is struck.	A No gas flowing to welding region.	A Check the gas lines for kinks or breaks and gas cylinder contents.
	B Torch is clogged with dust.	B Clean torch
	C Gas hose is cut.	C Replace gas hose.
	D Gas passage contains impurities.	D Disconnect gas hose from torch then raise gas pressure and blow out impurities.
	E Gas regulator turned off.	E Turn on.
	F Torch valve is turned off.	F Turn on.
	G The electrode is too small for the welding current.	G Increase electrode diameter or reduce the welding current.
4 Poor weld finish.	Inadequate shielding gas.	Increase gas flow or check gas line for gas flow problems.
5 Arc flutters during TIG welding.	Tungsten electrode is too large for the welding current.	Select the right size electrode. Refer to Table 4.
6 Welding arc can not be established.	A Work clamp is not connected to the work piece or the work/torch leads are not connected to the right welding terminals.	A Connect the work clamp to the work piece or connect the work/torch leads to the right welding terminals.
	B Torch lead is disconnected.	B Connect it to the '–' terminal.
	C Gas flow incorrectly set, cylinder empty or the torch valve is off.	C Select the right flow rate, change cylinders or turn torch valve on.
7 Arc start is not smooth.	A Tungsten electrode is too large for the welding current.	A Select the right size electrode. Refer to Table 4.
	B The wrong electrode is being used for the welding job	B Select the right electrode type. Refer to Table 5.
	C Gas flow rate is too high.	C Select the correct rate for the welding job. Refer to Table 6.
	D Incorrect shielding gas is being used.	D Select the right shielding gas. Refer to Table 8.
	E Poor work clamp connection to work piece.	E Improve connection to work piece.

15.2 Stick Welding Problems

Description	Possible Cause	Remedy
1 Gas pockets or voids in weld metal (Porosity).	A Electrodes are damp.	A Dry electrodes before use.
	B Welding current is too high.	B Reduce welding current.
	C Surface impurities such as oil, grease, paint, etc.	C Clean joint before welding.
2 Crack occurring in weld metal soon after solidification commences	A Rigidity of joint.	A Redesign to relieve weld joint of severe stresses or use crack resistance electrodes.
	B Insufficient throat thickness.	B Travel slightly slower to allow greater build up in throat.
	C Cooling rate is too high.	C Preheat plate and cool slowly.

	Description	Possible Cause	Remedy
3	A gap is left by failure of the weld metal to fill the root of the weld.	A Welding current is too low. B Electrode too large for joint. C Insufficient gap. D Incorrect sequence.	A Increase welding current B Use smaller diameter electrode. C Allow wider gap. D Use correct build-up sequence.

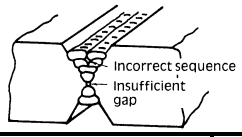


Figure 5 – Example of insufficient gap or incorrect sequence

4	Portions of the weld run do not fuse to the surface of the metal or edge of the joint.	A Small electrodes used on heavy cold plate. B Welding current is too low. C Wrong electrode angle. D Travel speed of electrode is too high. E Scale or dirt on joint surface.	A Use larger electrodes and pre-heat the plate. B Increase welding current C Adjust angle so the welding arc is directed more into the base metal D Reduce travel speed of electrode E Clean surface before welding.

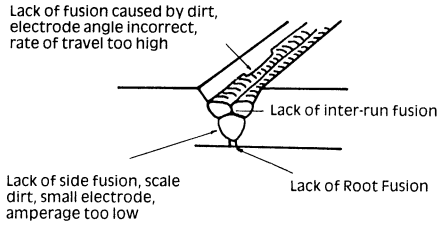

Lack of fusion caused by dirt, electrode angle incorrect, rate of travel too high
Lack of inter-run fusion
Lack of side fusion, scale dirt, small electrode, amperage too low
Lack of Root Fusion

Figure 6 – Example of lack of fusion

5	Non-metallic particles are trapped in the weld metal (slag inclusion).	A Non-metallic particles may be trapped in undercut from previous run. B Joint preparation too restricted. C Irregular deposits allow slag to be trapped. D Lack of penetration with slag trapped beneath weld bead. E Rust or mill scale is preventing full fusion. F Wrong electrode for position in which welding is done.	A If bad undercut is present, clean slag out and cover with a run from a smaller diameter electrode. B Allow for adequate penetration and room for cleaning out the slag. C If very bad, chip or grind out irregularities. D Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from corners. E Clean joint before welding. F Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.

Figure 7 – Examples of slag inclusion

15.3 Power Source Problems

Description	Possible Cause	Remedy
1 The welding arc cannot be established	A The Mains supply voltage has not been switched ON. B The Welding Power Source switch is switched OFF. C Loose connections internally.	A Switch ON the Mains supply voltage. B Switch ON the Welding Power Source. C Have an Accredited CIGWELD Service Agent repair the connection.
2 Maximum output welding current can not be achieved with nominal Mains supply voltage.	Defective control circuit	Have an Accredited CIGWELD Service Agent inspect then repair the welder.
3 Welding current reduces when welding	Poor work lead connection to the work piece.	Ensure that the work lead has a positive electrical connection to the work piece.
4 No gas flow when the arc is struck.	A Gas hose is cut. B Gas passage contains impurities. C Gas regulator turned off. D TIG torch gas valve is turned off	A Replace gas hose. B Disconnect gas hose from the TIG torch then raise gas pressure and blow out impurities. C Turn gas regulator on. D Turn gas valve on

15.4 Power Source Error Codes

Description	Possible Cause	Remedy
1 E01 error code displayed Temperature sensor TH1 (protects IGBTs) is greater than 80ºC for about 1 second	A The Welding Power Source's duty cycle has been exceeded. B Fan ceases to operate. C Air flow is restricted by vents being blocked	A Let Power Source cool do within its duty cycle. B Have an Accredited CIG Agent investigate C Unblock vents then let P cool down.
2 E02 error code displayed Temperature sensor TH2 (protects secondary diodes) is greater than 80ºC for about 1 second	A The Welding Power Source's duty cycle has been exceeded. B Fan ceases to operate. C Air flow is restricted by vents being blocked	A Let Power Source cool do within its duty cycle. B Have an Accredited CIG Agent investigate C Unblock vents then let P cool down.
3 E03 error code displayed Primary (input) current too high	A Primary current is too high because welding arc is too long. B Mains supply voltage is more than 10% below nominal voltage	A Reduce length of weldin B Have an Accredited CIG Agent or a qualified elec for low Mains voltage.
4 E11 error code displayed Over mains supply (input) voltage at primary capacitors is exceeded for one second	Mains supply voltage is greater than the nominal voltage plus 10%	Have an Accredited CIG Agent or a qualified elec the Mains voltage.
5 E14 error code displayed Under mains supply (input) voltage warning primary capacitors is reduced for one second	Mains supply voltage warning; it is down to 340V ac for 3 phase machine	Have an Accredited CIG Agent or a qualified elec the Mains voltage.

Description	Possible Cause	Remedy
6 E12 error code displayed Under mains supply (input) voltage primary capacitors is reduced for one second	A Mains supply voltage warning; it is down to 304V ac for 3 phase machine. B One phase has dropped out for 3 phase machine	A Have an Accredited CIG Agent or a qualified elec the Mains voltage B Have an Accredited CIG Agent or a qualified elec the primary cable & fuse
7 E81 error code displayed Wrong mains supply (input) voltage connected	When 3 phase machine is first turned on with the wrong mains supply (input) voltage connected	Have an Accredited CIG Agent or a qualified elec the Mains voltage
8 E82 error code displayed Link switch plug not connected	Link switch plug not connected	Have an Accredited CIG Agent check connector p PCB
9 E83 error code displayed CPU checks mains supply (input) voltage when the on/off switch on rear panel of machine is turned ON.	The mains supply (input) voltage fluctuates and is not stable.	Have an Accredited CIG Agent check connector p PCB and the Mains volt
10 E85 error code displayed Primary capacitors are not charging correctly	The primary capacitors pre-charge circuit is not functioning correctly	Have an Accredited CIG Agent check the primary main PCB
11 E93 error code displayed Memory chip (EEPROM) on control PCB can not read/write weld parameters	Memory chip (EEPROM) error	Have an Accredited CIG Agent check the control
12 E94 error code displayed Temperature sensor TH1 for IGBTs or sensor TH2 for secondary diodes are open circuit	The Welding Power Source's temperature sensors have malfunctioned.	Have an Accredited CIG Agent check or replace t sensors.
13 E99 error code displayed Mains supply (input) voltage has been turned off but control circuit has power from the primary capacitors	A Main on/off switch on machine has been turned off B Mains supply (input) voltage has been turned off	A Turn on/off switch on. B Have an Accredited CIG Agent or a qualified elec the Mains voltage and fu